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from such an author they command respect and are sure to be widely quoted. On page 96 we find this assertion:

In many of the more low-lying swampy coasts crab-holes occur in enormous numbers in the sandy soil, and in them are bred vast numbers of mosquitoes. In fact they constitute the chief nuisance in those houses which are situated near the sea.

The region in question is the tropical American littoral and the mosquitoes concerned are the species of the genus *Deinocerites* and certain species of *Culex*, all of which breed exclusively in crab-holes. I can myself testify to the abundance of these mosquitoes in their very restricted habitat, but must challenge the learned author's statement that these mosquitoes are offensive in the manner he indicates. Even where their breeding places are in close proximity to houses these mosquitoes do not enter, much less bite. Out of hundreds of specimens, collected by ourselves and received from correspondents, not one shows traces of a blood-meal, nor have we been able to observe that they are in the least attracted to human beings. On the other hand, we have female specimens of *Culex extricator*, one of the crab-hole species, in which the abdomen, distended with food, is of a pale amber color, showing that the food taken was not vertebrate blood.

Such error, however, does no harm beyond the useless expenditure entailed in the destruction of these inoffensive insects. In the case of the control of the yellow-fever mosquito a wrong assumption becomes a more serious question. The Sanitary Department of the Isthmian Canal Commission deserves great credit for its effective work in the control of this mosquito, and it is primarily the thoroughness of this work that is making possible the rapid progress in the construction of the Panama Canal. The report of the Department of Sanitation for January, 1910, gives brief data on the character of this work and the gratifying results achieved in the reduction of this mosquito.

There can be no doubt that the yellow-fever mosquito has been reduced below the

danger-point within the Canal Zone, a thing made easily possible by its habits of close association with man. The implied claim, however, that this mosquito has been eradicated from certain localities within the zone can hardly be accepted upon the evidence presented. This consists of a faulty experiment based upon the erroneous idea that the yellow-fever mosquito normally lays its eggs upon the surface of the water.

At the native town in Gorgona wooden tubs with water were put under the houses on November 6, 1909, and between that time and January 6, 1910, no *Stegomyia* eggs were deposited. Had *Stegomyia* been present, eggs on the water surface would probably have been found.

The inference is that, because no larvæ appeared in the tubs and no eggs upon the surface of the water, no yellow-fever mosquitoes could be present in that locality. Such, however, is not the normal habit of oviposition of this mosquito. The eggs are deposited out of the water, at the edge of the water-film; here the eggs remain until they are submerged, when they promptly hatch. Eggs remaining out of the water retain their vitality a long time. In laboratory experiments eggs have been kept dry as long as five months and, when then submerged, produced larvæ; under favorable conditions out-of-doors it is to be supposed that they will survive even longer. Under the domestic arrangements of the more primitive tropical homes the conditions are ideal for the multiplication of this mosquito. The water receptacles in common use, which are the ordinary breeding places of this mosquito, are seldom, if ever, completely emptied; water is added from time to time, and thus whenever the water level is raised eggs can hatch. It will be readily seen that in the experiment quoted above eggs of the yellow-fever mosquito might easily have been present but could not have hatched, as the water in the tubs remained undisturbed.

FREDERICK KNAB

THE AMERICAN PHILOSOPHICAL SOCIETY

THE general meeting of the American Philosophical Society was held in the hall of the society, Independence Square, Philadelphia, on Thursday,

Friday and Saturday, April 21, 22 and 23. The session was opened on Thursday at 2 P.M. by the president, Dr. W. W. Keen, who occupied the chair throughout the meetings except at the afternoon session of Friday, which was presided over by Vice-President Professor William B. Scott, and the session of Saturday morning, when Vice-President Professor Edward C. Pickering presided. The afternoon of Saturday was devoted to a symposium on "Experimental Evolution," the principal papers being given by Herbert S. Jennings, professor of experimental zoology in Johns Hopkins University, on "Inheritance in Non-sexual and Self-fertilized Organisms"; George H. Shull, resident investigator, Station for Experimental Evolution, Carnegie Institution, Washington, on "Germinal Analysis through Hybridization," and Charles B. Davenport, director of Station for Experimental Evolution, Carnegie Institution, on "New Views about Reversion." Professor William L. Tower, of the University of Chicago, was also to have contributed a paper, but was prevented from attendance. After the principal papers, a number of other members participated in the discussion.

At the session on Saturday morning Professor C. L. Doolittle read an obituary notice of Simon Newcomb, late vice-president of the society, and presented a portrait of Professor Newcomb contributed by members of the society. The portrait was accepted by Vice-President Pickering.

On Friday evening a reception was held at the hall of the College of Physicians, at which Professor George E. Hale gave an illustrated lecture on the Mount Wilson Solar Observatory, describing the instruments and observations carried on at the observatory and at the laboratory in Pasadena connected with it. The session closed with an annual dinner held at the Bellevue Stratford on Saturday evening, April 23. About ninety members were present. At this dinner the toasts were as follows: "Benjamin Franklin," by Charles Francis Adams, Esq.; "Our Sister Societies," by President Ira Remsen; "Our Universities," by President James B. Angell; "The American Philosophical Society," by Dr. James W. Holland.

At the session on Friday morning the following were elected to membership:

Residents of the United States.—Simeon Eben Baldwin, LL.D., New Haven, Conn.; Francis G. Benedict, Ph.D., Boston, Mass.; Charles Francis Brush, Ph.D., LL.D., Cleveland, Ohio; Douglas Houghton Campbell, Ph.D., Palo Alto, Cal.; William Ernest Castle, Ph.D., Payson Park, Bel-

mont, Mass.; George Byron Gordon, ScD., Philadelphia, Pa.; David Jayne Hill, LL.D., American Embassy, Berlin; Henry Clary Jones, Ph.D., Baltimore, Md.; Leo Loeb, M.D., Philadelphia, Pa.; James McCrea, Ardmore, Pa.; Richard Cockburn Maclaurin, F.R.S., LL.D. (Cantab.), Boston, Mass.; Benjamin O. Peirce, Ph.D., Cambridge, Mass.; Harry Fielding Reid, Ph.D., Baltimore, Md.; James Ford Rhodes, LL.D., Boston, Mass.; Owen Willans Richardson, M.A. (Cantab.), D.Sc. (Lond.), Princeton, N. J.

Foreign Residents.—Adolf von Baeyer, Ph.D., M.D., F.R.S., Munich; Madame S. Curie, Paris; Sir David Gill, K.C.B., Sc.D., LL.D., F.R.S., London; Edward Meyer, Ph.D., LL.D., Berlin; Charles Emile Picard, Paris.

In addition to the symposium on "Evolution," fifty-one papers were presented. A list of these with a brief summary of their contents follows.

The Great Japanese Embassy of 1860; The Forgotten Chapter in the History of International Amity and Commerce: PATTERSON DUBOIS, Philadelphia.

An account of this embassy and especially of its visit to the Philadelphia mint and investigation of our system of coinage, etc.

The Government of the United States in Theory and in Practice: C. STUART PATTERSON, Philadelphia.

The federal government has taken a highly centralized form very different from the ideals of the founder of the republic and at variance with the early theory of the balance of power between national government, state and citizen.

On some Philosophical Ideas in Zoroastrianism: A. V. WILLIAMS JACKSON, New York. (Read by title.)

Magical Observances in the Hindu Epic: E. WASHBURN HOPKINS, New Haven.

The practise of magic and recognition of its effects as portrayed in literature, notably in the epic, as contrasted with hymns and magic rules, which inculcate the rites only, formed the subject of this paper. Hindu literature has a number of works in which magic formulæ are given and hymns evidently written for the purpose of magic; but in the Hindu epic literature we see the application of these rules and hymns, and the magic which elsewhere is taught is here actively employed. One of the chief fields of application of magic in a war-epic is naturally that of magic weapons. The idea underlying magical weapons is identical with that of the savage of Australia.

By means of a mystic word, an ordinary weapon becomes bewitched and acquires supernatural power. Magic in sacrifice was shown to lead to human sacrifice, that out of the dead new life might arise. Water-magic was shown to result in the Hindu custom of touching water in making a vow, etc. The evil eye was found to be an article of faith with all the epic characters; also the belief in the king's healing touch, etc. The paper took up, one by one, all the observances noticed in the great epic, which is seven times as long as the Iliad and Odyssey put together.

The Bearded Venus: MORRIS JASTROW, Jr., Philadelphia.

In a hymn to the goddess Ishtar, the expression occurs that "she is bearded like the god Ashur." On the basis of this phrase, the conclusion has been drawn that the Babylonians and Assyrians conceived of Ishtar as both male and female.

It appears, however, that in astrological texts the planet Venus, who is identified with Ishtar, is frequently described as having a "beard"; and it is evident from the connection in which this phrase is used, as well as from explanatory remarks added in the astrological texts in question, that the reference is either to the brilliant, sparkling appearance of the planet or to the blurred appearance which suggests the rough fringes of a beard. The phrase in the hymn to Ishtar, therefore, is based upon the metaphor used of the planet Venus, and as the further context of the hymn shows, is intended to convey the idea that Ishtar is as "brilliant" as the solar god, Ashur.

The second part of the paper was devoted to an investigation of the evidence for a bearded Venus among the Greeks and Romans. It was shown that most of the passages upon which such an hypothesis was based were capable of a different explanation. So, for example, the statement of Herodotus that the priestess of the war goddess of the Carians (whom Herodotus identified with Athene), grows a beard when hostilities are brewing, evidently refers to a prevailing custom, according to which the priestess puts on a beard in order to emphasize, in accord with the principle of sympathetic magic, the hope that the war goddess will manifest her power and strength. The beard in this case is the symbol of the warrior, and it may be that the significant passage in Servius, who states that there was an image of a bearded Venus in Cyprus, is to be explained by some similar custom.

The conclusion reached by Professor Jastrow

was that it was more than doubtful whether in the Greek Pantheon, as little as in that of Babylonia and Assyria, there was such a figure as a "bearded lady." The problem was distinct from that of "hermaphroditism," which is a comparatively late phenomenon in Greek religion, the earliest reference to it being in Theophrastus; nor does it follow from the fact that the goddess in question, both among the Semites and Aryans, was occasionally viewed as having the traits of a male deity, that she would be regarded anywhere at one and the same time as both male and female.

Early Greek Theories of Sound and Consonance: WM. ROMAINE NEWBOLD, Philadelphia.

Historical Aspect of German Mysticism of the Fourteenth Century: KUNO FRANCKE, Cambridge.

A characteristic feature of all Romantic literature is the tendency to oscillate between the extremes of symbolism and naturalism. The dwelling together of these two extremes in particularly intense and particularly refined individuals is nothing accidental. It is founded on the inner affinity between symbolism and naturalism, on their both springing from the common root of an unusually high-strung subjectivity. All truly artistic grasp of life comes from within. The symbolist finds the essence of things in his own inner self. In the throng of shapes and images that arise before him from within he sees the true reality. The tangible and visible he replaces by a world of his own creation, a world of higher, finer, more spiritual values. But the naturalistic artist also is far removed from being a mere imitator of outward reality. He transports himself into the inner life of things, he feels that the whole variety of the outer world streams forth from one mighty source. He feels akin to this mighty power, he feels the impulse to create a living world. His art, therefore, although seemingly objective, is, like that of the symbolist, the product of his own high-pitched subjectivity.

In the few greatest artists of all ages, in a Dante, Shakespeare, Goethe, these two diverging but kindred tendencies, the symbolistic and the naturalistic, are melted together into an indissoluble unity. In less harmonious, more erratic personalities, such as Amadeus Hoffmann, Poe, Ibsen, Hauptmann and other Romanticists, there is, instead of this unity of contrasting elements, a constant clash between them, a continuous oscillation between extravagant symbolism on the one hand, and inexorable naturalism on the other.

A striking illustration of this peculiarity of Romantic literature is to be found in the writing of the German mystics of the fourteenth century.

To an analysis of the symbolistic and naturalistic elements of German mystic literature of the fourteenth century the bulk of the paper was devoted.

The New Shakespeare Discoveries: FELIX E. SCHELLING, Philadelphia.

The newly discovered references to Shakespeare include amongst other things an anecdote concerning his father, a reference to Shakespeare in the capacity of a tax-payer in the parish of St. Helen's Bishops Gate, some other information concerning the coat of arms finally granted to Shakespeare, a reference to Shakespeare as the designer of an impressa for the Earl of Rutland in 1613, and several of the discoveries by Professor C. W. Wallace, recently made in the Public Record Office in London. The chief amongst these is the final settlement of the question of the value and proportion of the interest of Shakespeare in both the Blackfriar's and the Globe theaters and a definite proof of his place of abode during the period of some years from 1598 onward.

A German Monk of the Eleventh Century: A. C. HOWLAND, Philadelphia.

A study of the life and writings of Othloh of St. Emmeram to illustrate the reform tendencies in the religious life of south Germany in the eleventh century. The writings of Othloh are of a peculiarly intimate character and contain more autobiographical material than is to be found in any other writings of the period. Besides the information they give us of the writer's own feelings and ideals they exhibit the two chief characteristics of German religious tendencies in this time—the fostering of an active intellectual life and the inculcation of practical morality. The paper describes the early education of Othloh, his ambition to acquire culture, which led him at one time to contemplate studying in the Moorish schools of Spain, his sudden conversion to the monastic life by what he considered a miracle and his struggles to reconcile the ideals of this new life with his old devotion to poetry and pagan learning. Examples are also given of his moral teachings and his interest in the every-day life of the plain people about him.

New Fields of German-American Research: M. D. LEARNED, Philadelphia.

Rich fields for investigation may be found in the German archives for researches on the causes

of German emigration to the United States. Another promising field is the question of the influence of American ideas on modern German culture.

The Real Meaning of the Controversy concerning Pragmatism: ALBERT SCHINZ, Bryn Mawr.

While truth remains always the same, each aspect of truth which we wish to emphasize depends upon accidental circumstances. This is the case of pragmatism, which gives the useful as the criterion of truth. There are two sorts of useful, the scientifically useful and the socially or morally useful. There are conflicts between the two. In such cases of conflict, pragmatists try to substitute the second for the first, *e. g.*, they advocate freedom of the will, or religion on the ground of their moral usefulness. The conclusion is that pragmatism is not really a philosophy of truth, but a philosophy of the expedient, socially speaking; and although pragmatists refuse to acknowledge openly what is clearly contained in their premises, it implies stopping science wherever science conflicts with morality. The author realizes the importance of the social problem involved, but would propose another solution. Instead of stopping science, let us be very cautious in spreading abroad the results of science; let us do away with such institutions as university extension and popular science in magazines. Such pseudo-philosophies like pragmatism ought to be rendered useless by a better economy of scientific truth.

Physical Notes on Meteor Crater, Arizona: WILLIAM F. MAGIE, Princeton.

Meteor Crater is a vast crater situated in Coconino County, Arizona, formed by the impact of an iron meteorite, or group of meteorites. Scattered specimens of these meteorites (the Canyon Diabolo siderites and the shale ball siderites) are found around the crater, but the main mass has not yet been found. It probably is buried 1,000 feet below the surface.

1. The Canyon Diabolo iron shows a magnetic permeability not very different from that of cast iron. The shale ball iron seems to be generally similar to it in its magnetic properties. Several observations indicate an intrinsic magnetization, peculiarly arranged, in the shale ball iron. The sheets of iron oxide, formed from the shale ball iron, are often intrinsically magnetic, but have very low permeability.

The magnetic field of the crater shows no local peculiarities such as would be expected from the presence of a large continuous mass of iron. The

inference is that the mass is fragmentary, perhaps intrinsically magnetized, and also perhaps largely oxidized.

2. The distribution of the ejected material and the inclinations of the exposed strata around the crater wall show a remarkable symmetry with respect to a nearly north-and-south axis. This symmetry, even in details, appears in holes made by bullets in a suitable mass of compacted powder. The inference is that the crater was formed by a projectile.

3. The mass ejected is estimated at 330 million tons. The energy used to lift it out of the hole is a negligible fraction of the energy expended. Most of the energy expended was used in crushing the rock. An estimate based on the assumption that the powdered sandstone was heated to $2,500^{\circ}\text{C}$. would indicate an expenditure of 92.5×10^{12} ft. tons of energy. Taking everything into account, it seems reasonable to estimate in all an expenditure of 60×10^{12} ft. tons of energy.

Taking this for the energy expended, and estimating the probable velocity of the meteor as lying between 3 and 48 miles a second, the mass of the meteoric group would lie between 15 million and 60 thousand tons.

The size and shape of the crater lead one to estimate a mass larger than this lowest limit; and the final estimate is that the mass is 400 thousand tons and that its velocity was from 18 to 20 miles a second.

The Conversion of the Energy of Carbon into Electrical Energy by Solution in Iron: PAUL R. HEYL, Philadelphia.

It is found that carbon dissolves in molten iron with a liberation of energy, which, by providing a suitable negative element, may be obtained as an electric current. The electromotive force thus developed has not yet been definitely determined, but is probably not more than one or two hundredths of a volt. There is no possibility of compounding this electromotive force with the accompanying thermal effect, as the two are opposite in direction.

The One-fluid Theory of Electricity: FRANCIS E. NIPHER, St. Louis.

The author has shown in a former paper that what have been taken for discharges from the positive terminal of an electrical machine are really optical illusions. The positive discharge is really an inflow of the electrical discharge which flows outward from the negative terminal. This is in harmony with the one-fluid theory of Frank-

lin. With this paper he presents photographic plates showing the discharge from its first stages until the disruptive spark appears. These plates fully confirm the former conclusion that there is no positive electrical discharge. The discharge comes from the negative terminal and goes to the positive.

The illusion which has led to the idea of a positive discharge is compared to one which might prevail if Niagara Falls should suddenly recede from Lake Ontario to Lake Erie. It might deceive us into the idea that there had been a positive discharge into Lake Erie.

The Past and Present Status of the Ether: A. G. WEBSTER, Worcester.

The history of the conception of the luminiferous ether was covered from the time of Newton and Huygens to the present. For the last hundred years the belief in the ether as necessary to transmit light has been universal. Lord Kelvin devoted most of his life to establishing its properties. The various mechanical theories were succeeded by Maxwell's successful electromagnetic theory, confirmed twenty years later by the electric wave experiments of Hertz. To explain astronomical aberration and the phenomena due to the earth's motion Maxwell's theory was severely strained, and was perfected by Lorentz. The classic experiment of Michelson on the apparent fixity of the ether to the earth in its motion, was explained by Lorentz, though by the violent assumption that motion changes the dimensions of bodies, and that the local time of a moving observer is different from that of an observer at rest. From this comes Einstein's principle of relativity, which profoundly modifies our ideas of space and time, and leads many radicals to abandon the ether. The "ether crisis" is the leading question in physics to-day.

The Ether Drift: AUGUSTUS TROWBRIDGE, Princeton.

Professor Trowbridge spoke very briefly of the general question of relative motion of matter and the ether, and pointed out that in spite of the experimental work of various investigators we are still in doubt as to whether the ether in its motion through ether-filled space entrains the ether in its motion or not. Next he explained in what respect the experimental method adopted by Professor Mendenhall and himself differed from that of former investigators so as to be free from the objections which have rendered the previous work inconclusive. Lastly a report of progress of

the work which is not yet completed and for the speedy completion of which the Rumford Fund has made an appropriation.

The Effects of Temperature on Fluorescence and Phosphorescence: E. L. NICHOLS, Ithaca.

A summary of observations on fluorescence and phosphorescence from the temperature of liquid air to ordinary temperatures, showing that the theory of Lenard is inadequate to correlate all the facts.

Infra-red and Ultra-violet Landscapes: ROBERT WILLIAMS WOOD, Baltimore.

Photographs taken with infra-red and ultra-violet light, using appropriate absorption screens, show greatly altered contrasts. Thus some substances which are white when viewed by ordinary light appear black when photographed with ultra-violet light. By such photographs it may be possible to obtain additional details concerning the surface markings of the moon and planets.

New Optical Properties of Mercury Vapor: ROBERT WILLIAMS WOOD, Baltimore.

Newton's Rings as Zone-plates: ROBERT WILLIAMS WOOD, Baltimore.

A zone plate may be automatically produced by photographing Newton's rings in monochromatic light. This may be copied by ruling circles with a diamond on a glass plate mounted on a turn table, the photograph being used as a guide to determine the radii of the rays. Copies of this may then be made in celluloid.

New Surgery of the Viscera of the Chest: ALEXIS CARREL, New York.

The Cause of Epidemic Infantile Paralysis: SIMON FLEXNER, New York.

A report on the experimental study of poliomyelitis in monkeys which has yielded a large number of important facts relating to the spontaneous disease in man. The nature of the virus has been discovered, many of its properties have been ascertained, some of its immunity effects have been established, the clinical and pathological peculiarities of the disease have been elucidated, and a basis has been secured on which to develop measures of prevention.

Description of the Brain of an Eminent Chemist and Geologist (a member of this Society) together with a Note concerning the Size of the Callosum in Eminent Men: EDWARD ANTHONY SPITZKA, Philadelphia.

A description of the brain of Persifor Frazer, author of many books, reports and papers on

geology, chemistry, mathematical problems and handwriting.

The brain was normal, in good condition, and weighed 1,580 grams, being about 250 grams over that of average persons of his age. The ratio of weight of cerebellum, to that of the cerebrum, is as 1:8.07; while among ordinary men it averages 1:7.5.

Among the pronounced anatomic features which place this brain in the superior class, aside from the weight and fissural complexity, are: (1) superior degree of differentiation of the motor centers for the utterance of speech and for word-arrangement, (2) great redundancy of the right subparietal region encroaching upon and shortening the sylvian fissure, (3) a large corpus callosum, or commissural bundle of fibers joining the two hemispheres of the cerebrum together, affording a superior degree of coordination between them. In Dr. Frazer's brain it measures, in cross-section area, 10.26 sq. cm. The average size of the callosum in ordinary persons is somewhat less than 6 sq. cm. Some years ago the author first showed that many eminent men, though not all, have a larger callosum, out of proportion even, to the factor of brain-weight alone. The callosum is most fully developed in the human species concomitantly with the greater development of cerebral parts; it may be looked upon as an index of the elaboration of at least one division of the association systems—*i. e.*, those concerned with bilateral coordinations.

The redundancy of the right posterior association area in Dr. Frazer's brain may be interpreted, in the light of previous investigations on other brains, as corresponding to a superior ability to register and compare the impressions in the visual, auditory and tactile spheres (the concrete-concept sphere).

A Brain of about One Half the Average Weight from an Intelligent White Man: BURT G. WILDER, Ithaca. (Illustrated by specimens, photographs and diagrams.) (Read by title.)

The Poisonous Group in the Protein Molecule: VICTOR C. VAUGHAN, Ann Arbor. (Read by title.)

Characteristics of Existing Continental Glaciers: WILLIAM H. HOBBS, Los Angeles, Cal. (Read by title.)

Dermal Bones of Paramylodon from the Asphaltum Deposits of Rancho la Brea, near Los Angeles, Cal.: WILLIAM J. SINCLAIR, Princeton. The paper describes the mode of occurrence,

shape and microscopic structure of the skin bones of an edentate animal from the Los Angeles asphaltum beds. These bones, which are small pebble-like elements in the skin, resemble closely similar bones occurring in a piece of skin found in a cave at Last Hope Inlet, Patagonia. They are also known to occur in *Myloodon*, a genus of ground sloths formerly living in North and South America. As the structure of the skin bones in *Myloodon* is quite different from what it is in *Grypotherium*, the form from the Last Hope Inlet locality, it was a matter of interest to find out to which of these genera the specimens from the asphalt showed the closer resemblance. Thin sections of the bones were cut and these prove that *Paramyloodon* from the asphaltum beds is almost identical, in the structure of the skin bones, with *Grypotherium*, a contemporary of early man in Patagonia.

The Restored Skeleton of Leptauchenia decora: WILLIAM J. SINCLAIR, Princeton.

A restoration of the skeleton of this small extinct hoofed animal from South Dakota has been prepared from specimens in the collection of Princeton University. Hitherto only the skull has been figured. The restoration shows the animal to have been about twenty-one inches long from tip of nose to root of tail and about ten inches high at the shoulder.

Correlation of the Pleistocene of the New and Old Worlds: HENRY FAIRFIELD OSBORN, New York. (Read by title.)

The Primates of the Old and the New Worlds, together with Man: GIUSEPPE SERGI, Rome, Italy. (Read by title.)

A Note on Antarctic Geology: WILLIAM MORRIS DAVIS, Cambridge.

The lively interest now aroused in Antarctic exploration suggests that the special attention of geologists should be directed to a problem of great interest that may possibly be solved by special studies in far southern latitudes. It is well known that fossil plants have been found in various formations in the Arctic and Antarctic regions, indicating the former prevalence there of a much milder climate than that of to-day. Our prepossession naturally favors the present polar climate as having been the ordinary or normal polar climate of all geological time; but inasmuch as milder climates have sometimes occurred, it is eminently possible that they, and not the present rigorous climate, may have been the usual polar climate through the geological ages. Hence a

peculiar interest attaches to studies of the minute structures of stratified formations, particularly of such as are of continental origin; for from such studies it may well be possible to determine climatic conditions even in the absence of fossils. It is fitting that attention should be directed to this problem by its discussion before a society that, more than any other in this country, has promoted renewed interest in Antarctic exploration.

The Italian Riviera—A Study in Geographical Description: WILLIAM MORRIS DAVIS, Cambridge.

After a geographer has seen a district it is his responsibility to describe it in such a manner that other geographers who have not seen it may get as clear a conception of it as possible. For this purpose experiment is here made on the picturesque Riviera Levante, between Genoa and Spezia, following the method which may be called the method of "structure, process and stage"; because the land forms observed are treated first in terms of the rock structures of which they are composed; second, in terms of the processes of sculpture that have worked on their surface; third, in terms of the stage of development reached by these processes in their task of the complete destruction of the lands. Briefly stated, the Riviera Levante is a district of deformed strata, for the most part sandstones and limestones of similar resistance, which in an earlier cycle of normal erosion was reduced to small relief; the lowland thus produced was then tilted to the southwest, and in this attitude it was maturely dissected by normal erosive agencies and maturely retrograded by the sea, with the result of having all its spurs cut off in great terminal facets along a simple shore line. This stage of development having been reached, the district was in recent time very gently tilted on an axis through its middle at right angles to the general coast line; and thus slightly elevated to the northwest and depressed to the southeast; as a consequence, an abraded marine platform was revealed in increasing height and breadth to the northwest; while the valleys and sea-cliff facets were submerged to increasing depth towards the southeast. Since this change took place, the streams have cut down mature valleys across the raised platform, and the sea has cut away its outer margin; while on the other side of the axis of tilting, the drowned valleys have been filled with delta deposits, and the cliff-facets have been somewhat steepened at

the new water line. The location of villages and the lines of transportation are shown to be closely related to the forms thus described.

Some Recent Results in Connection with the Absorption Spectra of Solutions: HARRY C. JONES, Baltimore.

The absorption spectra of dissolved substances are not simply a function of the nature of the substances, but also of the nature of the solvents. Thus in the case of solutions of uranyl chloride we have one spectrum in water, another in alcohol, still another in acetone and a spectrum in glycerol which is very different from any of the above. The only way in which we can account for these results is in terms of the solvate theory. The different solvents combine with the dissolved substance and form solvates having very different compositions. These affect the resonance of the vibrators that are the cause of light absorption, differently; and, consequently, the absorption in the different solvents is different.

The second point upon which stress is laid has to do with the action of one acid on the salt of another acid. In terms of prevailing chemical theories, when a salt of one acid is treated with a small amount of another acid, a part of the salt is transformed into the salt of the second acid. With the addition of more and more of the free acid, more and more of the initial salt would pass over into the salt of the second acid. In such solutions we should expect to have the bands of both salts occurring simultaneously, with varying intensity, depending upon the amounts of the two salts present. The fact is that when a salt is treated with a free acid, we have neither the bands corresponding to the initial nor the final salt present, but bands occupying positions intermediate between those of the two salts; and these bands can be made to occupy any intermediate position by suitably varying the amount of the free acid relative to the salt. This shows that between the initial salt, and the one finally formed, there is a series of intermediate compounds or systems, corresponding to the various positions of the bands.

The number of reactions showing the above relations is not small, and this raises the question whether chemical reactions in general are not much more complex than is usually represented by our chemical equations, which deal only with the initial and final stages.

The Propagation of Explosions in Mixtures of Petroleum Vapor with Air in Tubes: CHARLES E. MUNROE, Washington, D. C.

What Constitutes a Species in Agave: WILLIAM E. TRELEASE, St. Louis.

An analysis of the difficulties met with in obtaining flowering and fruiting material in the slow-maturing agaves; in finding spontaneous plants identifiable with many of the garden forms described as species; and in applying vegetative characters consistently and dependably. The conclusion is reached that though differing much in aspect, species of this genus are reasonably constant in their spine and prickly characters—illustrations being derived from the century plants, henequens, zapupes, mezcots and pulque magueys.

Suppression and Extension of Spore-formation in Piper betel: DUNCAN S. JOHNSON, Baltimore.

The interesting feature of the structure of the flower in this plant is the presence of male flowers, female flowers and flowers bearing the organs of both sexes, on three separate kinds of spikes. But flowers of each sex often bear some rudiments of organs of the other sex. This shows that while some flowers are apparently of one sex only, they really possess, in some degree, the power to develop the organs of the opposite sex. In other words, the cells from which the flowers arise are capable of forming the organs of both sexes, and the fact that one sex only is formed is probably due to some influence, internal or external, affecting the cells at the time that the flowers are being initiated.

Experimental work on certain plants has shown that a change in the light or soil supplied to apparently unisexual individuals may cause the organs of the other sex also to appear. This seems clear evidence that both sexes may really be present in all apparently unisexual plants, but that sometimes one, sometimes the other of these is suppressed or fails to become evident. The only plants of which this seemingly can not be true are those well-known unisexual plants like the sago palm, cotton-woods and willows, in which each individual bears only male flowers or only female flowers year after year, throughout the life of the plant. Another case is that of one of the mosses, in which it has been shown by Noll that the sex remained constant for thirty generations when male or female plants are propagated by budding.

A Method of Using the Microscope: N. A. COBB, Washington, D. C.

The Use of the Hydrometer in Phytogeographic Work: JOHN W. HARSHBERGER, Philadelphia.

The distribution of plants in salt marshes and along salt-water estuaries is determined by the percentage of salt in the water and in the soil. This can be estimated indirectly by a hydrometer reading directly the specific gravity of liquids heavier than distilled water, the readings being afterwards reduced to percentages of salinity. This specific gravity can be determined for each salt marsh and saline species of plants by collecting the water at the roots of the plants and estimating its salinity by hydrometer with a thermometer attachment. By this means the transition from salt-water to fresh-water vegetation can be studied.

Solar Activity and Terrestrial Magnetic Disturbances: L. A. BAUER, Washington.

A recent examination of the times of beginning of magnetic disturbances, as recorded at observatories over the entire globe, showed that, without doubt, magnetic storms do not begin at absolutely the same instant of time, as heretofore believed. Instead, they progress around the earth, the times generally increasing as we go around the earth eastwardly; for the quick and abrupt disturbances, which are usually comparatively minute in their effect on the compass needle, the complete passage around the earth requires from three to four minutes. For the bigger effects or for the greater magnetic storms, the rate of progression is slower, so that it would take them a half hour or more to get around the earth completely. There is thus introduced a new point of view in the investigation of the origin of magnetic storms.

In addition to negatively charged electrified particles coming from the sun to which recent theories sought to attribute our magnetic storms, but which the speaker found would produce effects not in harmony with those actually observed, we also receive radiations such as the Röntgen rays, for example, which are not deflected by the earth's magnetic field as they do not carry electric charges. Their chief effect will be to ionize the gases of which the atmosphere is composed, *i. e.*, make the air a better conductor of electricity. Ultra-violet light has the same effect. It is known that a small part of the magnetic forces acting on a compass needle is due not to the magnetism or electric currents below the earth's surface, but to electric currents already existing in the atmosphere and which the speaker showed were brought about by the atmosphere cutting across the earth's lines of magnetic force in its general circulation around the globe. If the regions of these upper

electric currents are at any time made more conducting by some cause, electricity will be immediately set in motion, which in turn affects our compass needles.

This new theory, called "the ionic theory of magnetic disturbances," satisfactorily explains the principal features of magnetic storms. As the currents get lower down in the atmosphere their velocity is checked, so that instead of taking but three to four minutes to circulate around the earth, as do the higher currents, it may take them a half hour and more; however, their actual effect on the magnetic needle would be greater because of their coming nearer to the earth. The theory also opens up the possibility of accounting for some of the other changes and variations experienced by the earth's magnetism, and likewise has a bearing on the peculiar formation of the magnetic fields in sunspots discovered by Professor Hale.

Magnetic Results of the First Cruise of the "Carnegie": L. A. BAUER, Washington.

The non-magnetic vessel *Carnegie* completed on February 17 last the first cruise, covering in all since September 1, 1909, 8,000 miles. Special tests made at Gardiners Bay, Long Island, and at Falmouth, England, proved conclusively that there are no corrections to the magnetic instruments of the kind encountered on vessels in which more or less iron occurs in the construction. Thus in a single voyage errors could be disclosed in the compass charts used by mariners on their transatlantic voyages of importance not alone from a scientific standpoint, but from that of practical and safe navigation as well.

The errors found by the *Carnegie* in the declination at various points along the track followed by the vessel from Long Island Sound to Falmouth, England, amounted on the average to about 1 degree—an error which persisted in the same direction for long distances.

After leaving Falmouth, the *Carnegie* headed for Funchal, Madeira. Thence she sailed to Bermuda, and finally arrived at Brooklyn, February 17. In spite of the unusually adverse conditions frequently met with during this first cruise, more or less extensive magnetic observations were secured almost daily.

The errors of the compass charts were found in general even more pronounced for the southerly half of the cruise, *viz.*, Madeira to Bermuda, than for the northerly half, and were again shown to be systematic in their nature. Some of the charts were in error two to three degrees.

For the entire cruise important corrections were also disclosed for the charts which give the lines of equal magnetic dip and of equal magnetic force.

The *Carnegie* is now being fitted out for a circumnavigation cruise of about three years. Meantime, the magnetic surveys of unexplored countries are pushed, so that it is confidently expected that by the year 1915 the general magnetic survey of the greater part of the globe will have been completed in sufficient detail to permit the construction and issuing of a new set of magnetic charts.

Spectra of Recent Comets: EDWIN B. FROST, Williams Bay, Wis.

On the Distances of Red Stars: HENRY NORRIS RUSSELL, Princeton.

Comparison of the parallaxes of stars, derived by the writer from photographs taken at the Cambridge Observatory (England) by Mr. A. R. Hinks and himself, and their spectra, determined at Harvard under the direction of Professor Pickering, shows a marked correlation between spectral type and parallax.

The proportion of orange and red stars (types K and M) among those of large proper motion, and especially among those shown by direct measurement to be our near neighbors, is very much greater than among the general run of stars of the same apparent brightness. Conversely, stars of the same apparent brightness and proper motion average nearer to the redder they are.

It follows that these stars are intrinsically fainter the redder they are, the reddest ones averaging only one fiftieth as bright as the sun. On the other hand, many bright red stars (such as Arcturus) are at great distances, and are actually at least one hundred times as bright as the sun.

All this can be explained on the hypothesis (now well established on other grounds) that the reddest stars are the lowest in temperature. With the latest determinations of temperature and surface brightness, it appears that the fainter red stars are somewhat smaller, and presumably denser, than the sun, while the brighter ones are very much larger than the sun, and presumably of very small density. The latter class probably represent an early stage of evolution, and the former the latest stage that can be observed.

A Standard System of Photographic Stellar Magnitudes: EDWARD C. PICKERING, Cambridge.

Since 1879, about two million photometric ob-

servations of one hundred thousand stars have been made at the Harvard College Observatory. The results, published in volumes 50, 54 and 70 of the *Harvard Annals*, furnish a standard scale for determining the brightness of the stars in all parts of the sky, according to a uniform system.

The general introduction of photography in nearly all departments of astronomy has created an urgent need for a similar scale to give the photographic magnitudes of the stars. The two scales will differ, since red or yellow stars will always photograph faint. The scale proposed will be the same for white stars as the visual scale. Three methods are adopted in this work for determining the photographic brightness. First, correcting the visual magnitude by the class of spectrum. Secondly, by measuring with great care the photographic brightness of a sequence of stars near the north pole, and superposing this photographically on the stars to be measured. Thirdly, by attaching to the object glass of the telescope a small prism, a second image of each star, five magnitudes fainter than the principal image, is formed.

All three of these methods are in use on a large scale at the Harvard Observatory, and it is hoped that, as the result of many thousand measures, a satisfactory solution of the problem will be found.

The Existence of Planets about the Fixed Stars: T. J. J. SEE, Mare Island, Cal. (Read by title.)

Results of Recent Researches in Cosmical Evolution: T. J. J. SEE, Mare Island, Cal. (Read by title.)

Some Interesting Double Stars: ERIC DOOLITTLE, Philadelphia.

The many thousand double stars in the sky may be divided into two classes. There are some in which the two stars are not really near each other, but which merely happen to lie in the same direction as viewed from the earth, and there are others which form true systems composed of two suns revolving about their common center of gravity. In the latter case, measures show that one sun revolves about the other in an elliptic orbit. It often happens that a very few measures of such a system secured at certain critical times throw unusual light on the nature of the motion and the size of the orbit. This is especially the case when the companion star apparently ceases its motion in one direction and begins to move backward, and also when the companion is passing nearest the principal star. Several diagrams

were shown describing measures of this kind which had recently been secured. An account was also given of the discovery of a very close double star during its occultation by the moon.

Radioaction in the Heavenly Bodies: MONROE B. SNYDER, Philadelphia.

Radioaction the Cause of Hale's Anomalous Solar Spectrum: MONROE B. SNYDER, Philadelphia.

Certain Singularities in the Problem of Several Bodies: EDGAR ODELL LOVETT, Houston, Texas.
(Read by title.)

Groups Generated by two Operators, each of which Transforms the Square of the Other into a Power of Itself: GEORGE A. MILLER, Illinois.
(Read by title.)

The Origin of our Alphabet and the Race of the Phenicians: PAUL HAUPT, Baltimore.

The Phenicians were not of Semitic stock, but colonists probably from Crete or Cyprus. The origin of the alphabet can hardly be ascribed to them as the derivation of the letters points to their having originated among a more agricultural community.

HORACE CLARK RICHARDS

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE SOCIAL AND ECONOMIC SCIENCE¹

FOUR sessions of the Section of Social and Economic Science were held at the Boston meeting, including the first, at which the vice-presidential address was the feature; the second, at which social questions, such as divorce, immigration and public baths, were discussed and papers read; an economic and statistical session with papers on costs of public works, methods of assessments in taxation and general economic progress; and a final session at which were considered the tariff in its more scientific phases, timber growing, economic clubs, racial studies and the mathematical measurements of the economic earning power of the individual man. Out of fourteen assignments on the program, twelve of the authors were present and read their papers in person.

The vice-presidential address, by Byron W. Holt, on "The Gold Question" was published in the January number of *Moody's Magazine*, and J. F. Crowell's paper, on "Some Consequences of Advancing Prices," in the February issue of the same periodical.

¹ Boston meeting, December, 1909.

Among the papers of special scientific merit, embodying the results of research, were those of Harrison P. Eddy, C.E., on the "Desirability of the Contract System of Constructing Public Works," in comparison with other methods employed in municipal administration; and of A. C. Pleydell, secretary of the New York Tax Reform Association, on "The Need for More Scientific Methods of Assessment." The latter paper dealt with the conditions of corporate assessment under liability to local government units. Professor Lazenby's paper on "Timber Trees of Ohio" gave an instructive account of the growth of timber to meet specific commercial needs.

Under "Phases of Economic Progress in the United States," Col. Albert Clarke summarized the achievements in the following fields: aeronautics, automobiles, agriculture, hydro-electrics, canal construction and irrigation during the past ten years.

Fred C. Croxton, of Washington, outlined some of the results of the work of the United States Immigration Commission, with special regard to the adjustment of the immigrant to the various industries and occupations.

William H. Hale, of Brooklyn, described the work of the public baths administration in that city as evincing a tendency to look upon it as a public necessity, and reported that over 2,274,000 people had availed themselves in the eleven months ending November 30, 1909.

J. W. Beatson, of the National Economic League, Boston, reported on the extension of economic clubs in New England and eastern cities, with memberships ranging from 200 to 1,500 each, where nearly 500 subjects had been discussed.

Seymour C. Lewis, of New Haven, Conn., described the purpose and limitations of the tariff board as the first step in the direction of a scientific mastery of the tariff problem.

Samuel W. Dyke, Auburndale, Mass., summarized the present status of the divorce question in the United States, stating that the present ratio of divorce to marriage was about one to twelve; that the average length of married life before divorce for the past twenty years was 9.9 years, and that separation in 27 per cent. of the known cases occurs within less than two years of married life.

Dr. E. E. Holt, of Portland, Me., presented a paper on the mathematical formula of the normal earning ability of the individual, defining the